FORM PTO-1390 (REV. 12-2001) U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY 'S DOCKET NUMBER: ACD2713

U S APPLICATION NO (If known, see 37 CFR 1 5): 10/031225

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP00/06234	3 July 2000	16 July 1999

TITLE OF INVENTION: REST-BREAKING COMPOSITION AND USE THEREOF

APPLICANT(S) FOR DO/EO/US: Brian P. MacDonald and Hennie A. Workel

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [XX] This is a **FIRST** submission of items concerning a filing under 35 U S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [XX] This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. [ ] The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. [XX] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [ ] is attached hereto (required only if not communicated by the International Bureau).
   b. [XX] has been communicated by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [XX] An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a [ ] is attached hereto.
   b. [XX] has been previously submitted under 35 U.S.C. 154(d)(4).
7. [ ] Amendments to the claims of the International Aplication under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are attached hereto (required only if not communicated by the International Bureau).
   b. [ ] have been communicated by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [ ] have not been made and will not be made.
8. [ ] An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. [XX] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). (unsigned)
10. [ ] An English lanugage translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. [ ] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [XX] A FIRST preliminary amendment. "Version with markings to show changes made"
14. [ ] A SECOND or SUBSEQUENT preliminary amendment.
15. [ ] A substitute specification.
16. [ ] A change of power of attorney and/or address letter.
17. [ ] A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. [ ] A second copy of the published international application under 35 U S.C. 154(d)(4).
19. [ ] A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. [XX] Other items or information: Copy of Intnl. Search Report dated October 10, 2000
    Copy of Intnl. Preliminary Examination Report dated June 6, 2001
    Express Mail Label No: EM122093452US

531 Rec'd PCT/PTO 16 JAN 2002

U.S. APPLICATION NO (If known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
10/031225	PCT/EP00/06234	ACD2713

21. ☒ The following fees are submitted:

	CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **$1040.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$890.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO **$740.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) **$710.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) **$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 890.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	17 - 20 =	0	x **$18.00**	$
Independent claims	2 - 3 =	0	x **$84.00**	$
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$280.00**	$

TOTAL OF ABOVE CALCULATIONS =	$ 890.00	
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2. +	$	
SUBTOTAL =	$ 890.00	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)).	$	
TOTAL NATIONAL FEE =	$ 890.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +	$	
TOTAL FEES ENCLOSED =	$ 890.00	
	Amount to be refunded:	$
	charged:	$ 890.00

a. ☐ A check in the amount of $ _____ to cover the above fees is enclosed.

b. ☒ Please charge my Deposit Account No. ~~01-1350~~ in the amount of $ 890.00 to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 01-1350. A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO

Ralph J. Mancini
AKZO NOBEL INC.
7 Livingstone Avenue
Dobbs Ferry, NY 10522-3408
(914)674-5465

Ralph J Mancini
SIGNATURE

Ralph J. Mancini
NAME

34, 054
REGISTRATION NUMBER

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of: MacDonald, B et al.	
	Docket No.: ACD2713
Serial No.: Unassigned	
Int'l Application No.: PCT/EP00/06234	Group Art Unit:
Int'l Filing Date: July 3, 2000	
Priority Date: July 16, 1999	Examiner:
Title: Rest-Breaking Composition and Use Thereof	

Assistant Commissioner of Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

In accordance with the provisions of 37 C.F.R. §1.111, applicants provide the following amendments and remarks for entry in the above-identified case.

IN THE SPECIFICATION

Please amend the specification as follows:

At page 1, after the Title, please insert the following:

--The present application was filed on July 3, 2000 as application serial number PCT/EP00/06234 and claims priority of European patent application No. 99202342.4 filed on July 16, 1999.--

IN THE CLAIMS

Please cancel claims 1-9.

Please amend the claims as follows:

--11. The composition of claim 10 wherein the organic nitrogen-containing compound is selected from the group consisting of (2-hydroxyethyl)tri(C_1-C_3)alkylammonium salts, (2-hydroxypropyl)tri(C_1-C_3)alkylammonium salts, and (2-hydroxybutyl)tri(C_1-C_3)-alkylammonium salts, and mixtures thereof.--

--12. The composition of claim 11, wherein the organic nitrogen-containing compound is a (2-hydroxyethyl)trimethylammonium or choline salt.--

--13. The composition of claim 12 wherein the organic nitrogen-containing compound is choline chloride.--

--14. The composition of claim 10 wherein the inorganic nitrate rest-breaking agent is selected from the group consisting of potassium nitrate, calcium nitrate, ammonium nitrate, calcium ammonium nitrate, urea ammonium nitrate, zinc ammonium nitrate, and mixtures thereof.--

--15. The composition of claim 14 wherein the inorganic nitrate rest-breaking agent is selected from the group consisting of calcium nitrate, calcium ammonium nitrate, urea ammonium nitrate, and mixtures thereof.--

--16. The composition of claim 10 wherein the surfactant is an alkoxylated amine or alkoxylated quaternary ammonium compound.--

--17. The composition of claim 16 wherein the surfactant is an alkoxylated amine.--

Please add the following new claims:

--18. A method for breaking the rest in deciduous fruit species which comprises applying to said species a rest-breaking composition which comprises an organic nitrogen-containing compound having a molecular weight of 60 to 300, an inorganic nitrate rest-breaking agent, and a surfactant with the proviso that said nitrogen containing compound is not urea or dinitro-ortho-cresol.--

--19. The method of claim 18 wherein the deciduous fruit species is selected from the group consisting of apple species and grape species.--

--20. The method of claim 18 wherein the organic nitrogen-containing compound is selected from the group consisting of (2-hydroxyethyl)tri(C_1-C_3)alkylammonium salts, (2-hydroxypropyl)tri(C_1-C_3)alkylammonium salts, and (2-hydroxybutyl)tri(C_1-C_3)-alkylammonium salts, and mixtures thereof.--

--21. The method of claim 18 wherein the organic nitrogen-containing compound is a (2-hydroxyethyl)trimethylammonium or choline salt.--

--22. The method of claim 21 wherein the organic nitrogen-containing compound is choline chloride.--

--23. The method of claim 18 wherein the inorganic nitrate rest-breaking agent is selected from the group consisting of potassium nitrate, calcium nitrate, ammonium nitrate, calcium ammonium nitrate, urea ammonium nitrate, zinc ammonium nitrate, and mixtures thereof.--

--24. The method of claim 23 wherein the inorganic nitrate rest-breaking agent is selected from the group consisting of calcium nitrate, calcium ammonium nitrate, urea ammonium nitrate, and mixtures thereof.--

--25. The method of claim 18 wherein the surfactant is an alkoxylated amine or alkoxylated quaternary ammonium compound.--

--26. The method of claim 25 wherein the surfactant is an alkoxylated amine.--

Remarks

This is an international application filed under the Patent Cooperation Treaty (PCT) on July 3, 2000. The examiner is respectfully requested to note that as a result of amendments made before the International Bureau, the present application contains claims 1-17. In the present amendment, claims 1-9 are cancelled and new claims 18-26 are added to the application. New claims 18-26 correspond substantially with cancelled claims 1-9. Thus, subsequent to the subject Preliminary Amendment, claims 10-26 remain for consideration on the merits.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned **"Version with markings to show changes made."**

Since the present amendment raises no new issues and presents no new matter, entry thereof in accordance with 37 C.F.R. §1.111 prior to the initial examination of the present case on the merits is respectfully requested.

Respectfully submitted,

Ralph J. Mancini
Attorney for Applicants
Registration No. 34,054

Akzo Nobel Inc.
Intellectual Property Department
7 Livingstone Avenue
Dobbs Ferry, NY 10522-3408
(914) 674-5465

Version with markings to show changes made

The following sentence was added on page 1 of the specification after the title:

--The present application was filed on April 17, 2000 as application serial number PCT/EP00/03513 and claims priority of Swedish patent application No. 9901733-7 filed on May 12, 1999.--

The following amendments were made to claims 11-17.

11. The~~A~~ composition of~~according to~~ claim 10 wherein~~, characterized in that~~ the organic nitrogen-containing compound is selected from the group consisting of (2-hydroxyethyl)tri(C_1-C_3)alkylammonium salts, (2-hydroxypropyl)tri(C_1-C_3)alkylammonium salts, and (2-hydroxybutyl)tri(C_1-C_3)-alkylammonium salts, and mixtures thereof.

12. The~~A~~ composition of~~according to~~ claim 11 wherein~~, characterized in that~~ the organic nitrogen-containing compound is a (2-hydroxyethyl)trimethylammonium or choline salt.

13. The~~A~~ composition of~~according to~~ claim 12 wherein~~, characterized in that~~ the organic nitrogen-containing compound is choline chloride.

14. The~~A~~ composition ~~according to and one~~ of claims ~~10-13, characterized in that~~ wherein the inorganic nitrate rest-breaking agent is selected from the group consisting of potassium nitrate, calcium nitrate, ammonium nitrate, calcium ammonium nitrate, urea ammonium nitrate, zinc ammonium nitrate, and mixtures thereof.

15. TheA composition ofaccording to claim 14, characterized in that wherein the inorganic nitrate rest-breaking agent is selected from the group consisting of calcium nitrate, calcium ammonium nitrate, urea ammonium nitrate, and mixtures thereof.

16. TheA composition according to any one of claims 10-15, characterized in that wherein the surfactant is an alkoxylated amine or alkoxylated quaternary ammonium compound.

17. TheA composition ofaccording to claim 16, characterized in that wherein the surfactant is an alkoxylated amine.

The following new claims were added to the application.

--18. A method for breaking the rest in deciduous fruit species which comprises applying to said species a rest-breaking composition which comprises an organic nitrogen-containing compound having a molecular weight of 60 to 300, an inorganic nitrate rest-breaking agent, and a surfactant with the proviso that said nitrogen containing compound is not urea or dinitro-ortho-cresol.--

--19. The method of claim 18 wherein the deciduous fruit species is selected from the group consisting of apple species and grape species.--

--20. The method of claim 18 wherein the organic nitrogen-containing compound is selected from the group consisting of (2-hydroxyethyl)tri(C_1-C_3)alkylammonium salts, (2-hydroxypropyl)tri(C_1-C_3)alkylammonium salts, and (2-hydroxybutyl)tri(C_1-C_3)-alkylammonium salts, and mixtures thereof.--

--21. The method of claim 18 wherein the organic nitrogen-containing compound is a (2-hydroxyethyl)trimethylammonium or choline salt.--

--22. The method of claim 21 wherein the organic nitrogen-containing compound is choline chloride.--

--23. The method of claim 18 wherein the inorganic nitrate rest-breaking agent is selected from the group consisting of potassium nitrate, calcium nitrate, ammonium nitrate, calcium ammonium nitrate, urea ammonium nitrate, zinc ammonium nitrate, and mixtures thereof.--

--24. The method of claim 23 wherein the inorganic nitrate rest-breaking agent is selected from the group consisting of calcium nitrate, calcium ammonium nitrate, urea ammonium nitrate, and mixtures thereof.--

--25. The method of claim 18 wherein the surfactant is an alkoxylated amine or alkoxylated quaternary ammonium compound.--

--26. The method of claim 25 wherein the surfactant is an alkoxylated amine.--

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Rec'd PCT/PTO 16 JAN 2002
PCT/EP00/06234

REST-BREAKING COMPOSITION AND USE THEREOF

The invention relates to a rest-breaking composition and the use thereof.

Deciduous fruit species require winter chilling to grow normally. The amount of chilling required depends upon the kind of fruit and the cultivar. If winter chilling is insufficient, then growth abnormalities such as delayed and uneven blossoming, poor [illegible] insufficient fruit set, and reduced fruit size can occur. These sym[illegible]yed foliation.

Specification

Measures to red[illegible] include treatment with rest-breaking ag[illegible] physical manipulations such as prunin[illegible]st apple trees receive insufficient wint[illegible] thus annual application of a rest-breaking agent is standard practice.

The most widely used rest-breaking agents are dinitro-ortho-cresol (DNOC) in combination with oil and hydrogen cyanamide in combination with oil (e.g. Dormex sold by SKW Trostberg). The oil in these compositions is used to allow an even distribution of the agent over the species to be treated. It is to be noted that although DNOC/oil and hydrogen cyanamide/oil compositions are effective at breaking rest in deciduous fruit species, DNOC is harmful to the environment and its use is prohibited in Europe and the United States, and hydrogen cyanamide is toxic to man, limiting its use in certain rest-breaking applications.

Another known rest-breaking agent is potassium nitrate, which has been shown to have a positive effect on peach species. However, potassium nitrate is not as effective as DNOC or hydrogen cyanamide. It is to be noted that deciduous fruit species with a high chill requirement, such as grape species, require a relatively high concentration of such a rest-breaking agent.

WO 94/23574 describes additives which promote the activity of rest-breaking agents such as hydrogen cyanamide and potassium nitrate. These additives, i.e., surfactants which are also referred to as (tank mix) adjuvants, are alkoxylated amines (e.g. Armoblen®, sold by Akzo Nobel) and alkoxylated quaternary ammonium compounds.

WO 96/01049 and WO 97/24926 describe the use of the aforementioned types of additives (additionally disclosing the use of Armobreak®, sold by Akzo Nobel) in combination with hydrogen cyanamide and several inorganic nitrate rest-breaking agents, i.e., potassium nitrate, ammonium nitrate, calcium nitrate, urea ammonium nitrate, calcium ammonium nitrate, and zinc ammonium nitrate, and mixtures thereof.

Although the compositions described in the aforementioned international patent publications effectively break the rest in various deciduous fruit species, they do not reach the desired level of uniformity of bud break, nor the desired balance of vegetative and reproductive bud break.

GB-A-2 059 412 describes the application of an aqueous solution of a choline salt to enhance the reproductive development of plants including deciduous fruit trees such as apple, pear, plum, and peach trees. It is described that treatment of deciduous fruit trees results in break of dormancy.

However, as is shown in the Examples of the present patent application, the use of only a choline salt in combination with a surfactant does not give the desired rest-breaking activity either.

For the foregoing reasons, there is still a need in the art for improved rest-breaking compositions which are effective, less toxic than the most-effective compositions that are known in the art of rest-breaking, which can be employed

at economically and environmentally acceptable concentrations of the active ingredients, and which are non-hazardous to operators of the application equipment.

The present invention relates to a composition useful for the breaking of rest in deciduous fruit species comprising an organic nitrogen-containing compound having a molecular weight of 60 to 300 with the exception of urea and dinitro-ortho-cresol, an inorganic nitrate rest-breaking agent, and a surfactant.

The use of the composition of the present invention for breaking the rest of deciduous fruit species produces improvements in advancing the time of bloom, bud break and/or leaf cover and fruit set, leading to an improved quality of the fruit.
In Table 1 of the present application, the percentage of overall bud break is presented as a representative parameter for evaluating the rest-breaking activity of a given composition.

In the context of the present invention, by the term "deciduous fruit species" is meant any species which requires the use of a rest-breaking agent due to delayed foliation, in order to improve the yield and quality of the fruit in regions which have mild winter weather conditions.
Besides the term rest-breaking agent, the terms dormancy-breaking agent and bud-breaking agent are also used frequently in this field of technology.
Typical examples of deciduous fruit species include species bearing apples, pears, peaches, apricots, plums, cherries, grapes, vines, kiwis, nectarines, or almonds. The rest-breaking composition of the present invention is particularly suitable for use on apple species and grape species.

Preferably, the organic nitrogen-containing compound has a molecular weight of 60 to 250, more preferably 60 to 200, and most preferably 60 to 150.

Urea and dinitro-ortho-cresol have been excluded from protection, because urea may be added to the composition of the invention in the form of urea ammonium nitrate and dinitro-ortho-cresol is undesired due to the fact that it is harmful to the environment.

Typical examples of organic nitrogen-containing compounds in accordance with the present invention include ethylenediamine, (C_1-C_3)alkylated ethylenediamines such as N-methyl-ethylenediamine and N,N-diethylethylenediamine, ethanolamine, (C_1-C_3)alkylated ethanolamines such as N-methylethanolamine and N,N-diethylethanolamine, (carboxymethyl)tri-(C_1-C_3)alkylammonium salts such as (carboxymethyl)trimethylammonium hydroxide inner salt or betaine and 1-carboxy-N,N,N-trimethanaminium chloride or betaine hydrochloride, (2-hydroxyethyl)tri(C_1-C_3)alkylammonium salts such as (2-hydroxyethyl)trimethylammonium or choline chloride, (2-hydroxypropyl)tri(C_1-C_3)alkylammonium salts, (2-hydroxybutyl)tri(C_1-C_3)alkylammonium salts, and mixtures thereof.
The C_1-C_3-alkyl group preferably is a methyl or ethyl group, most preferably a methyl group. The term salt in the aforementioned classes of compounds is well known to the person skilled in the art and it typically refers to salts containing a halide ion such as a chloride ion or a (methyl)sulfate ion.

Preferably, the organic nitrogen-containing compound is selected from the group consisting of (2-hydroxyethyl)tri(C_1-C_3)alkylammonium salts, (2-hydroxypropyl)tri(C_1-C_3)alkylammonium salts, and (2-hydroxybutyl)tri(C_1-C_3)-alkylammonium salts, and mixtures thereof. More preferably, it is a (2-hydroxyethyl)trimethylammonium or choline salt. Most preferably, it is choline chloride.
Typical examples of choline salts which can be used in the composition of the invention include choline chloride, choline nitrate, choline phosphate, choline sulfate, choline bitartrate, choline dihydrogen citrate, tricholine citrate, choline bicarbonate, choline carbonate, and mixtures thereof.

It is to be understood that not all compounds may work on all deciduous fruit species in all orchards. For example, it was found that choline borate could not be used on Golden Delicious apples in South Africa. By routine experimentation one of ordinary skill in the art can establish, however, which compounds produce the desired rest-breaking effect and which do not.

Typical examples of inorganic nitrate rest-breaking agents or nitrogen fertilizers which can be used in the composition of the invention include alkali metal and earth alkali metal nitrates such as sodium nitrate, potassium nitrate, and calcium nitrate, ammonium nitrates such as ammonium nitrate itself, calcium ammonium nitrate, urea ammonium nitrate, and zinc ammonium nitrate, and mixtures thereof. Preferably, the inorganic nitrate rest-breaking agent is selected from the group consisting of potassium nitrate, calcium nitrate, ammonium nitrate, calcium ammonium nitrate, urea ammonium nitrate, zinc ammonium nitrate, and mixtures thereof. The use of calcium nitrate, calcium ammonium nitrate, urea ammonium nitrate, and mixtures thereof is particularly preferred.

In the context of the present invention, by the term "surfactant" is meant any compound which improves the distribution of the organic nitrogen-containing compound and the inorganic nitrate rest-breaking agent over the deciduous fruit species to be treated. Hence, oils such as those which have been used in combination with dinitro-ortho-cresol and hydrogen cyanamide, are also meant to be included in this term. As is known to the person skilled in the art, surfactants are typically classified as amphoterics, anionics, cationics, nonionics, and miscellaneous surfactants. It was found that, as is known in the art, the type of surfactant used is not critical. Any of the known types of surfactants may be used in the composition in accordance with the present invention, as long as they achieve an even distribution of the ingredients of the

invention composition over the deciduous fruit species to be treated. By routine experimentation one of ordinary skill in the art can establish which surfactants work, which do not, and which work best.

The alkoxylated amine surfactants and alkoxylated quaternary ammonium surfactants which are described in WO 94/23574 (i.e. on page 4, line 12, through page 8, line 17, and on page 12, lines 1-11), WO 96/01049 (i.e. on page 4, line 13, through page 8, line 10, and on page 12, lines 12-24), and WO 97/24926 (i.e. on page 4, line 24, through page 10, line 2) are particularly preferred for use in the invention composition. More preferably, an alkoxylated amine is used. Most preferably, Armoblen®, Armobreak®, and Berol® compounds, which are commercially available from Akzo Nobel Chemicals, are used in the invention composition.

In a preferred embodiment, the composition in accordance with the present invention comprises an organic nitrogen-containing compound selected from choline salts, an inorganic nitrate rest-breaking agent selected from potassium nitrate, calcium nitrate, ammonium nitrate, calcium ammonium nitrate, urea ammonium nitrate, zinc ammonium nitrate, and mixtures thereof, and a surfactant selected from alkoxylated amines.

The composition of the present invention is typically applied to the deciduous fruit species prior to blossom. The optimum time to break rest for a particular deciduous fruit species will depend upon several factors including the type of fruit, the cultivar, the climatic conditions, and the types and amounts of the rest-breaking agents being applied. For some fruit or cultivar species, the best rest-breaking effects are accomplished by early application of the rest-breaking composition, whereas for others it is best to wait until just before blossom. In general, the rest-breaking composition will be applied at some point between the time when winter has peaked and the time when blossoming begins.

The rest-breaking composition in accordance with the present invention is preferably applied in the form of an aqueous solution. As is known to the person skilled in the art, the invention compositions may be prepared on site by the end user shortly before application to the deciduous fruit species to be treated, and are referred to as tank-mix compositions, or alternatively may be provided to the end user already formulated, either at the desired dilution for application (i.e. ready-to-use compositions) or requiring dilution, dispersion or dissolution in water by the end-user (i.e. concentrate compositions). Such preformulated compositions are storage stable and may be liquid or dry.

The amounts of the organic nitrogen-containing compound and the inorganic nitrate rest-breaking agent to be used in the composition for breaking the rest of deciduous fruit species are dependent on a number of parameters including the deciduous fruit species and cultivar to be treated, the type of organic nitrogen-containing compound and inorganic nitrate rest-breaking agent used, the volume of the aqueous solution per hectare, the required total amount of nitrogen per hectare, the application equipment used, and the design of the orchard. For example, for the treatment of apple trees typically a volume of 1,500 litres per hectare is used, whereas for grape species only a volume of 150 litres per hectare is employed. By routine experimentation and with the guidance of the data provided in the Examples one of ordinary skill in the art can establish which amounts need to be used in any given situation.

The amount of surfactant in the ready-to-use aqueous solution typically is in the range of 0.1 to 10% by volume, preferably 1 to 10% by volume, more preferably 1 to 5% by volume, based on the total volume of the composition.

The composition of the invention is preferably applied in a manner similar to that in which commercial crop protection products and nutrients are applied.

More particularly, conventional equipment such as knapsack sprayers, hand-held spray guns, mist blowers, and aerial spraying equipment among others may be used. The compositions may also be applied directly to the plant by hand, if desired.

The use of the composition of the present invention has the following significant advantages: it breaks rest to the extent that the use of known, highly toxic rest-breaking agents can be eliminated, in a manner which is safe for the crops and without the treatment having any long-term phytotoxic effect on the plants, if carried out correctly. Further, its use will cause significantly less harm to beneficial insects when applied within the normal application volume, and its use appears to be environmentally acceptable, non-hazardous to operators of the application equipment, and non-corrosive to the equipment.

The present invention also relates to the use of the composition which has been described above for breaking the rest in deciduous fruit species, in particular in the case of apple species and grape species.

The present invention is illustrated by the following examples.

Comparative Examples A-D and Example 1

In these examples, five rest-breaking compositions in which the amounts of the ingredients present are expressed as volume percentage were applied to Golden Delicious apple trees in the course of 1998 in Somerset West, Cape Province, Republic of South Africa. The percentage of overall bud break was determined at two dates, i.e. October 5, 1998, at about the start of bud break, and October 26, 1998, at about the end of bud break. The results are depicted in Table 1. The higher this percentage, the better the rest-breaking effect of the composition.

With the compositions of Comparative Examples C and D and Example 1, 1.02 kg nitrogen equivalents/hectare of apple trees were distributed, the spray volume was about 1,500 litres/hectare.

Table 1. Effect of rest-breaking compositions on % overall bud break

Example	Composition (vol%)	Bud break (%)	
		Start	end
A	6% DNOC/oil	17	52
B	0.5% Dormex, 2% BP oil	13	36
C	1.5% Acer907s98, 6% GAN	12	26
D	1.5% Acer907s98, 13% AcerCC98	22	38
1	1.5% Acer907s98, 6.6% AcerCC98, 3% GAN	38	60

DNOC is dinitro-ortho-cresol formulated in oil

Dormex is hydrogen cyanamide

Acer907s98 or Berol®907 is an alkoxylated amine surfactant

GAN is a mixture of an aqueous calcium nitrate solution and an aqueous urea ammonium nitrate solution in a volume ratio of approximately 2:1

AcerCC98 is choline chloride (75 wt% aqueous solution)

The results in Table 1 indicate the synergistic effect of the combination of choline chloride, i.e. an organic nitrogen-containing compound, a mixture of calcium nitrate and urea ammonium nitrate, i.e. inorganic nitrate rest-breaking agents, and an alkoxylated amine, i.e. a surfactant, and the improvement over the rest-breaking compositions DNOC/oil and hydrogen cyanamide/oil of the prior art.

It was observed that, unlike the compositions of the prior art, the composition of Example 1 showed 100% terminal bud break. Futhermore, the invention composition showed an improved balance of reproductive versus vegetative bud break over the compositions of the prior art.

Comparative Examples E-F and Example 2

Table 2 lists the results of a rest-breaking trial on Golden Delicious apple trees in the course of the 1999-2000 growth season in the Western Cape of South Africa. Average fruit per cm stem diameter is a known measure for the fruit yield. Average fruit diameter in mm is a known measure for the quality of the fruit.

Table 2. Effect of rest-breaking compositions on fruit yield and quality

Example	Composition (vol%)	Average fruit per cm stem diameter	Average fruit diameter in mm
E	6% DNOC/oil	23.1	25.8
F	0.5% Dormex, 3% oil	26.3	26.5
2	1.5% Acer 907s98, 3.3% AcerCC98, 4.5% GAN	26.3	27.3

See the notes to Table 1.

The results in Table 2 indicate that as a result of using a rest-breaking composition in accordance with the present invention, fruit having a higher quality was obtained as compared to using a composition of the prior art.

10/031225
EPO - DG 1 ACD 2713 R
11 531 Rec'd PCT/PTO 16 JAN 2002
10. 05. 2001

CLAIMS submitted with a letter on May 9, 2001

(41)

1. Use of a composition comprising an organic nitrogen-containing compound having a molecular weight of 60 to 300 with the exception of urea and dinitro-ortho-cresol, an inorganic nitrate rest-breaking agent, and a surfactant, for breaking the rest in deciduous fruit species.

2. Use according to claim 1, characterized in that the organic nitrogen-containing compound is selected from the group consisting of (2-hydroxyethyl)tri(C_1-C_3)alkylammonium salts, (2-hydroxypropyl)tri(C_1-C_3)alkylammonium salts, and (2-hydroxybutyl)tri(C_1-C_3)-alkylammonium salts, and mixtures thereof.

3. Use according to claim 2, characterized in that the organic nitrogen-containing compound is a (2-hydroxyethyl)trimethylammonium or choline salt.

4. Use according to claim 3, characterized in that the organic nitrogen-containing compound is choline chloride.

5. Use according to any one of claims 1-4, characterized in that the inorganic nitrate rest-breaking agent is selected from the group consisting of potassium nitrate, calcium nitrate, ammonium nitrate, calcium ammonium nitrate, urea ammonium nitrate, zinc ammonium nitrate, and mixtures thereof.

6. Use according to claim 5, characterized in that the inorganic nitrate rest-breaking agent is selected from the group consisting of calcium nitrate, calcium ammonium nitrate, urea ammonium nitrate, and mixtures thereof.

7. Use according to any one of claims 1-6, characterized in that the surfactant is an alkoxylated amine or alkoxylated quaternary ammonium compound.

8. Use according to claim 7, characterized in that the surfactant is an alkoxylated amine.

9. Use according to any one of the preceding claims, characterized in that the deciduous fruit species is selected from the group consisting of apple species and grape species.

10. A composition useful for the breaking of rest in deciduous fruit species comprising an organic nitrogen-containing compound selected from the group consisting of ethylenediamine, (C_1-C_3)alkylated ethylenediamines, (carboxymethyl)tri-(C_1-C_3)-alkylammonium salts, (2-hydroxyethyl)tri(C_1-C_3)alkylammonium salts, (2-hydroxy-propyl)tri(C_1-C_3)alkylammonium salts, (2-hydroxybutyl)tri(C_1-C_3)alkylammonium salts, and mixtures thereof, an inorganic nitrate rest-breaking agent, and a surfactant.

11. A composition according to claim 10, characterized in that the organic nitrogen-containing compound is selected from the group consisting of (2-hydroxyethyl)tri(C_1-C_3)alkylammonium salts, (2-hydroxypropyl)tri(C_1-C_3)alkyl-ammonium salts, and (2-hydroxybutyl)tri(C_1-C_3)-alkylammonium salts, and mixtures thereof.

12. A composition according to claim 11, characterized in that the organic nitrogen-containing compound is a (2-hydroxyethyl)trimethylammonium or choline salt.

13. A composition according to claim 12, characterized in that the organic nitrogen-containing compound is choline chloride.

14. A composition according to any one of claims 10-13, characterized in that the inorganic nitrate rest-breaking agent is selected from the group consisting of potassium nitrate, calcium nitrate, ammonium nitrate, calcium ammonium nitrate, urea ammonium nitrate, zinc ammonium nitrate, and mixtures thereof.

15. A composition according to claim 14, characterized in that the inorganic nitrate rest-breaking agent is selected from the group consisting of calcium nitrate, calcium ammonium nitrate, urea ammonium nitrate, and mixtures thereof.

16. A composition according to any one of claims 10-15, characterized in that the surfactant is an alkoxylated amine or alkoxylated quaternary ammonium compound.

17. A composition according to claim 16, characterized in that the surfactant is an alkoxylated amine.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
25 January 2001 (25.01.2001)

PCT

(10) International Publication Number
WO 01/05227 A1

(51) International Patent Classification[7]: A01N 33/12 // (A01N 33/12, 59:16, 59:06, 59:00, 33:08, 25:30)

(21) International Application Number: PCT/EP00/06234

(22) International Filing Date: 3 July 2000 (03.07.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
99202342.4 16 July 1999 (16.07.1999) EP

(71) Applicant *(for all designated States except US)*: **AKZO NOBEL N.V.** [NL/NL]; Velperweg 76, NL-6824 AB Arnhem (NL).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **MACDONALD, Brian, P.** [NL/NL]; Nachtwachtplein 3, NL-7242 CT Lochem (NL). **WORKEL, Hennie, A.** [NL/NL]; Park Broekheurne 36, NL-7544 NK Enschede (NL).

(74) Agent: **SCHALKWIJK, Pieter, Cornelis**; Akzo Nobel N.V., Intellectual Property Dept. (Dept. AIP), P.O. Box 9300, NL-6800 SB Arnhem (NL).

(81) Designated States *(national)*: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 01/05227 A1

(54) Title: REST-BREAKING COMPOSITION AND USE THEREOF

(57) Abstract: The invention relates to a composition useful for the breaking of rest in deciduous fruit species such as apple species and grape species comprising an organic nitrogen-containing compound having a molecular weight of 60 to 300 with the exception of urea and dinitro-ortho-cresol, an inorganic nitrate rest-breaking agent, and a surfactant. Preferably, the organic nitrogen-containing compound is a choline salt such as choline chloride, the inorganic nitrate rest-breaking agent is selected from the group consisting of potassium nitrate, calcium nitrate, ammonium nitrate, calcium ammonium nitrate, urea ammonium nitrate, zinc ammonium nitrate, and mixtures thereof, and the surfactant is an alkoxylated amine such as Armoblen®*, Armobreak®*, and Berol®* compounds or an alkoxylated [illegible] ammonium compound.

Docket No.: **ACD2713 US**

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:
REST-BREAKING COMPOSITION AND USE THEREOF

☒ was filed on **3 July 2000** as Appln. Ser. No. **PCT/EP00/06234**

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. All factual statements made in the specification of my own knowledge are true and all factual statements made on information and belief are believed to be true.

I acknowledge to the duty to disclose information that is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, Sec. 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, Sec. 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

			Priority Claimed
99202342.4	Europe	16 July 1999	X Yes ___ No
(Number)	(Country)	(Day/Month/Year)	

I hereby claim the benefit under Title 35, United States Code § 119 of any provisional application(s) listed below:

Appln. Ser. No.	Country	Day/Month/Year

10031225.060502

ACD2713 US

I hereby claim the benefit under Title 35, United States Code, Sec. 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Sec. 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Sec. 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Appln. Ser. No.)	(Filing Date)	(Status: patented, pending, abandoned)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following as my attorneys of record, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent Office:

Louis A. Morris, Reg. No. 28,100
Ralph J. Mancini, Reg. No. 34,054
Joan M. McGillycuddy, Reg. No. 35,608
Richard P. Fennelly, Reg. No. 25,677
David H. Vickrey, Reg. No. 30,697
Lainie E. Parker, Reg. No. 36,123

Direct all correspondence to: Ralph J. Mancini
Akzo Nobel Inc.
Intellectual Property Department
7 Livingstone Avenue
Dobbs Ferry, NY 10522-3408
(914) 674-5465

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Sec. 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of first inventor, if any **Brian P. MacDonald**

Inventor's signature B.P. MacDonald

Date 26 Feb., 2002

Residence Lochem, the Netherlands NLX

Citizenship ~~Dutch~~ British

Post Office Address Nachtwachtplein 3, 7242 CT Lochem, the Netherlands

ACD2713 US

Full name of first inventor, if any **Hennie A. Workel**

Inventor's signature _____

Date 26th Feb 2002

Residence Enschede, the Netherlands NLX

Citizenship Dutch

Post Office Address Park Broekheurne 36, 7544 NK Enschede, the Netherlands

[redacted]